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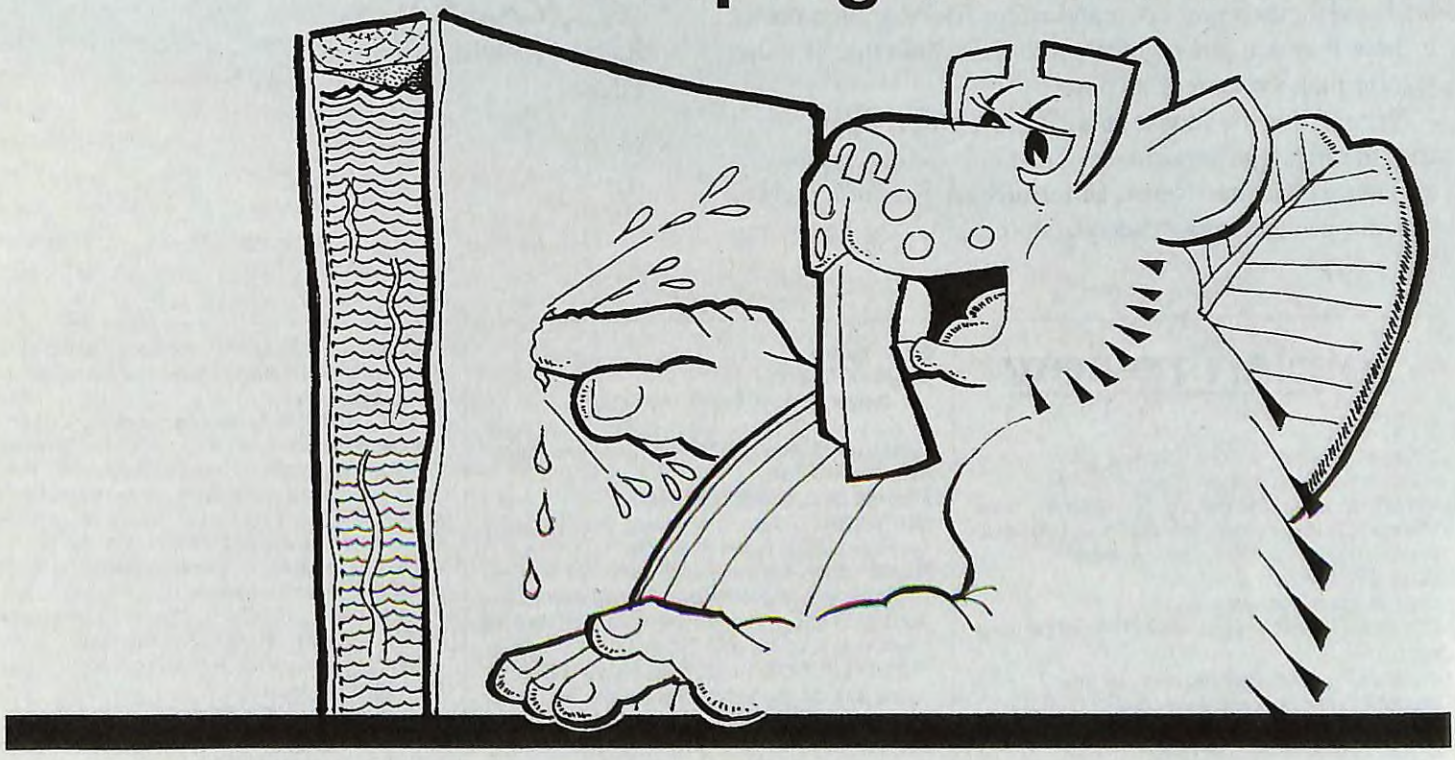
Keeping the Water Out



From the Editor . . .

We live in an age of specialization. Perhaps because we have developed the technologies we use to such a high level, it is more difficult to be a jack-of-all-trades than it once was. Inevitably, a measure of specialization is needed. There may be lots of value to right handed screws, plastic water piping, or whatever, but it all has a place in the greater world. The broader world must be kept in perspective.

One shortcoming of the Internet is that it makes it easy to focus on very narrow interests. you are not exposed to broader issues and trends like you are when looking at the print media or even TV. In these traditional media, you're exposed to items that you are not deliberately searching for. However, you may still stop and look at a headline, photo, or whatever.

Builders are in a unique situation because, more than most other professions, they create something large and of great impact on many. They can't be specialists with a narrow view. They have the pleasure of seeing their creative effort grow as they transform a pile of disjointed materials on a muddy piece of ground into a building that will house many generations.

The products builders have been handed to start this transformation may, in themselves, have been carefully analyzed for their properties and safety. The challenge comes in how they are put together, into the whole that is much greater than the sum of its parts.

We call this the "house as a system". This is a phrase that tries to reflect the importance of just how the diverse materials interact with each other. Unfortunately, manufacturers of specific products don't adequately consider the house into which their products will fit. Sometimes it may be acknowledged but the basic assumptions of the manufacturers may be flawed or totally unrealistic.

The builder, unfortunately, is left holding the bag for the consequences that arise from the use of products that manufacturers put on the market, with fine print disclaimers on installation manuals that no one sees or understands. If someone is poisoned due to the toxic effects of a product malfunction or because the product did what it was supposed to but it affected a different element, it's the builder who has to take the blame, not the product supplier.

Yet the builder doesn't always have the resources or skills to evaluate all these other elements properly. That's why manufacturers have their high-priced engineers to design and test components. But the components must not be considered in isolation of how they are going to be used in the finished building. Too often, the product is considered in isolation of the other parts of the house.

Similarly, builders must accept that many standards and regulations are an attempt to deal with some of these issues, and should be viewed in that light.

Richard Kadulski,
Editor

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Editor-Publisher: Richard Kadulski
Illustrations: Terry Lyster
Contributors: Ann Charlton, Tom Hamlin, Ross Monsour, Don Hazelden, John Broniek, Luc Saint-Martin, Thomas Greiner, John Teixeira
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e-mail: solplan@cyberstore.ca

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Vancouver, B.C. V6B 3N9

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Keeping the Water Out: Building Envelope Performance

The building envelope is meant to protect us from the elements. Many different materials are used successfully in various parts of the world. Over generations, many different systems using these materials to keep out the wind, rain, snow, and sleet have been developed.

Traditionally, a only few materials have been used in any one region and climate zone, so that designers and tradesmen learned how to use them successfully. Unfortunately, and especially in North America, we have increasingly been using a wider range of materials, mostly for aesthetic reasons. Building designs and materials chosen are often inappropriate for the region and its climate. To compound the problem, materials are often used incorrectly.

It does not help that designers and builders do not always understand the building science implications or pay enough attention to construction details. Confusion about basic water management strategies to be used to maintain an effective building enclosure is common. That is when serious problems are encountered, too often with devastating consequences.

The construction boom of recent years in the Vancouver area has pointed out this problem. The term "leaky condo" (it has been well publicized through the local media) has become a catch phrase among the general public for construction problems in new buildings. Throughout the region, relatively new buildings are wrapped in scaffolding and tarps while remedial work is being done. Driving around the area, it looks like a scene from of a science fiction movie - extra terrestrial insects weaving cocoons around buildings!

Problems have emerged despite continuing advances in the understanding of the behaviour of building envelopes, the efforts of various industry associations, and changes in codes and standards. Problems have included water penetration, damage to cladding systems, and rotting and decay of wood components (siding, framing members and sheathing). How big a problem is it? The cost of the repair work has averaged $8,552 per unit for stucco clad buildings, $4,635 for wood sided buildings and $1,818 for vinyl sided buildings.

Sometimes, the remedial work being done is superficial and does not adequately address the source of the problems on a long term basis. An example is the common use of sealants and coatings to attempt to prevent water penetration.

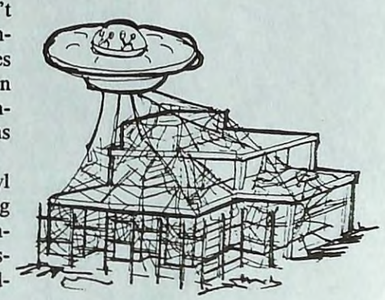
While most of the problems have happened in multi family projects, single family homes are not immune. However, the problem is not as common and doesn't get the same attention. Because of the seriousness of the issue CMHC, in partnership with industry undertook a study to investigate the problem. The objective was to find out the cause of the failures. While this study applies to problems found in the Vancouver area, the basic principles apply anywhere, as do the lessons learned.

To restrict the study to problem buildings (recently finished buildings that have encountered rapid deterioration), all buildings investigated were completed in 1985 or later. Forty-six three and four-storey wood frame, residential buildings in the Vancouver area were looked at: 37 had performance problems, and nine buildings with no outward signs of moisture problems were used as "control" buildings to compare and find out why they did not have problems.

Problem buildings were defined as those in which a moisture problem within the walls, decks, or exterior framing has resulted in damage requiring $10,000 or more to repair (this may include expenses for repairs that did not solve the problem).

The selection process for buildings studied was not random, so it doesn't provide a statistical picture of the construction styles and problems. It does give an idea if there are differences in materials, design, construction, or maintenance in buildings that have problems and those buildings that don't.

Three cladding types (stucco, vinyl and wood), and a range of sheathing paper, sheathing, insulation, and framing materials were studied. EIFS systems were excluded not because buildings with EIFS cladding are problem-free but because they are the subject of a separate study. Other types of cladding such as masonry are rare in this building type in the region. The buildings studied



new buildings wrapped in scaffolding and tarps ... looks like extra terrestrial insects weaving cocoons

the main source of moisture .... problems was exterior water finding its way into the walls rather than interior sources of construction moisture

included examples of two exterior sheathing papers (asphalt-impregnated building paper and housewrap) and two exterior sheathing materials (exterior grade plywood and OSB).

Clearly, the main source of moisture leading to the performance problems was exterior water finding its way into the walls rather than interior sources of construction moisture. Walls with roof overhangs had fewer problems than those without. (The proportion of problems drops with the increase in the width of overhang). Dry climate (California-Arizona desert style) building designs without overhangs had become popular, due to aesthetic considerations and restrictive planning regulations.

Water was found to enter the wall assemblies at junction details: primarily at windows, at the perimeter of decks, balconies and walkways, and at saddle locations. The problems were identified as being related to the design and construction rather than operations, maintenance, or the materials themselves.

Maintenance (or lack of) was not the cause of any problems. At best, maintenance activities might have reduced the severity of any damage. Operational aspects, such as damage to the wall cladding caused by residents attaching planters to the walls, were seen in only one case.

Most buildings used building paper and OSB. Few examples used both housewrap and plywood as these materials are less commonly used in the overall population of buildings. By far the most common wall type is stucco cladding, building paper, OSB sheathing, 89 mm wood frame with glass fibre insulation, interior vapour barrier and drywall.

It was evident that with respect to water management principles there was confusion in the design and construction of wall assemblies. Even on the "control" buildings (i.e., those with no problems), the wall design details used in many cases were poor, although the materials and installation were not. This points out that good construction practice can overcome poor design details, (or that the wall performance was not sensitive to that detail).

Typical Problems in the Details

The study focused on the path taken by the water to pass through the cladding. Sheathing paper problems were down played, but to cause leakage on the inside of the building or deterioration of sheathing and structure, both layers must be damaged.

Nearly all the problems relate to details such as windows, decks, and wall penetrations rather than to the basic construction of the wall assembly. In other words, it's not the siding itself that's the problem, but rather where it meets with penetrations and changes in material. While leakage happens at joints, over time the damage spreads to the adjacent surfaces. Wall areas not able to drain or dry quickly enough will result in damage.

Window details represent nearly one quarter of all reported problems. These include poor sealing of window frame mitre joints (a product manufacturing issue), no sealant at frame/cladding joint, poor flashing installation at the head or sill, and building paper installed backwards (allowing water to drain inside rather than shed water).

Nearly all the buildings looked at had aluminum frame windows with no thermal break (the code requirement for thermally broken aluminum frames did not come into effect until late 1992). These windows typically have a drained frame design; the frame joints are unsealed, as are the joints between the frame and the cladding; and the frame is often flush with the exterior face of the cladding. All these factors increase how much water passes over and around the window, and the potential for water to enter the window opening.

Waterproof membranes on decks, balconies, and exterior walkways are another big problem area. It is rarely the application of the membrane on the substrate that causes problems; rather it is a poor design or construction execution of its joints with penetrations and walls. Saddle joints of balcony/walkway guardrails with surrounding walls and defects in balcony rail cap flashings are a large problem category. Many of these problems are the result of poor detailing of these joints.

Sheathing Papers

It has been suggested that housewraps are more suitable as a sheathing paper than the traditional asphalt coated building paper. The number of buildings in this study using housewrap is too small to draw any conclusions, although there is an indication that housewrap may reduce the number of problems experienced. It could also be that the walls with housewrap take longer before problems are noticed and cost less to repair than walls using conventional building paper.

One unstated but contributing factor to failures with stucco are inappropriate trades practices.

Workers in the Vancouver area often have mixed regular laundry soap into the stucco mix so it spreads more easily. However, soap also reduces surface tension of water molecules, making them flow more easily. This means that the surface tension in the materials such as housewraps is reduced, allowing water to flow through the material - meaning the housewrap loses its water resistance.

Plywood/OSB

To explain the unusual number of problem buildings, suggestions have been made that OSB sheathing has poorer resistance to wetting and drying cycles. However, evidence suggests that there is no direct relationship between the use of OSB sheathing and the cause or size of problems.

There is little difference between plywood and OSB in terms of vapour transmission and water absorption. Both are affected by long-term water exposure; both will swell and rot, although plywood will generally be less affected than OSB.

Orientation

Wind-driven rain is important in forcing water penetration through materials. The direction the wall faces was found to be a factor in about 30% of cases.

Insulation

Some people believe that increased insulation levels in wood frame walls have contributed to the problem by providing less heat to dry the exterior walls. In fact, the extra insulation, or at least a thicker wall, appears to improve the situation rather than make it worse.

Wall Drying Issues

The building envelope will experience variable conditions. In a maritime climate like Vancouver's, rain water is a dominant feature. Drainage and drying potential are significant variables in determining the ability of a wall to perform, so the drying ability of a wall is important. The quantity of wetting combined with the drying characteristics of the wall assembly will determine if a wall can accommodate the moisture and thus perform adequately.

The balance between the rate at which water enters the wall from the outside and leaves via drainage and evaporation will determine whether the wall provides durable performance or not. While the basic wall surface may not be a significant source of moisture ingress, it adds to the problem if its design restricts the ability to dry out. The problem walls always failed to balance moisture ingress, drainage and drying. Once wetted, the potential for drying of walls in the wet coastal climate during the winter months is limited.

There are essentially three ways that water can leave wall assemblies: gravity (drainage), movement of humid air, and diffusion. Drainage occurs in two modes: bulk water runs down through large cavities under the influence of gravity or air pressure, or water moves along very small passages in porous materials via capillary action and evaporates at the surface of the porous material (efflorescence in masonry is a visible example of capillary water movement). Bulk air movement can only occur if there are relatively large air passages through the wall. In terms of how much water can be removed, drainage through large air spaces is by far the highest-capacity.

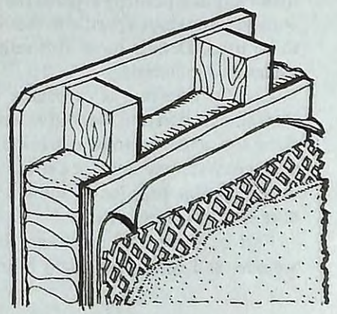
Face sealed wall assemblies (i.e., stucco) are very sensitive to design and construction variables, and require perfect application, or achieving acceptable performance may not be possible.

Drain screen wall assemblies offer the best opportunity to achieve acceptable performance. Vapour diffusion is a much slower process. It relies on movement of water vapour molecules through materials.

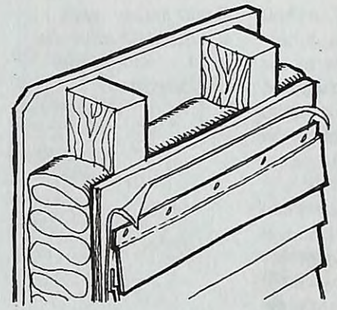
Drain screen wall assemblies offer the best ... acceptable performance.

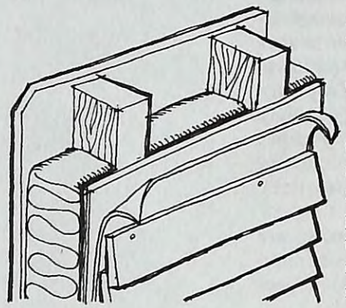
Stucco

The main way of drying out water that penetrates stucco is via capillary action and evaporation at the outer surface of the stucco. A combination of sheathing paper, membrane and metal flashings, if they are continuous, will restrict drying inwards. Air movement will be small as there is no cavity behind the stucco, so there is little chance for gravity flow of water between the stucco and the sheathing paper.



In the Vancouver climate, the outer wall surface will be wet a substantial part of the time during the winter due to the quantity of rainfall, high air humidity and resulting low drying potential. Low permeance coatings placed on the exterior of the stucco will further reduce its drying potential. As a result, the stucco remains wet and retains its contact with





the sheathing paper. If the sheathing paper is building paper, it relies on impregnated chemicals for water repellency. These chemicals will slowly dissolve and expose the paper, an organic material subject to rot. Once the paper disintegrates, the outer surface of sheathing is exposed to moisture.

Simulations show that a stucco wall without an acrylic finish coat over OSB will take about 10 weeks to dry out after a single wetting event (15 to 20 weeks when a low permeance coating is added). A 10-week dry period is not likely, so the wall doesn't get a chance to dry out.

Vinyl Siding

Vinyl siding placed directly over sheathing paper without any furring is similar to wood siding and contains horizontal air channels so that any water that penetrates behind the siding can leave the wall by gravity drainage down the relatively large channels, and by evaporation into the air. As a result, it is less likely to suffer major water exposure.

Wood Siding

Wood siding falls somewhere between stucco and vinyl siding in terms of providing opportunity for drying. The air channels are less regular and smaller than for vinyl siding, and the porous nature of wood means that only large amounts of bulk water can drain via gravity, after the wood is soaked.

The current study is the first step in a process that will hopefully help the construction community turn the corner toward improved building envelope performance. Following from this work, a Best Practices Guide for building envelopes will be developed.

Survey of Building Envelope Failures in the Coastal Climate of British Columbia
by: Morrison Hershfield Limited. Available from CMHC-BC office, $10.00 plus GST.
Contact Don Hazelden at:
Tel: 604-666-8068
Fax: 604-666-3020

How To Avoid Problems

Critical details have to be shown on the drawings, sometimes at a larger scale. Three dimensional or isometric drawings may be needed to describe the design intent.

Details on architectural drawings usually reflect generic components. They should be reviewed once the project is underway and perhaps evolved into shop drawings or further working drawings specific to the materials and components to be used. Details must also reflect logical sequencing of trades and materials.

Careful detailing is especially needed for windows and their integration into the wall assembly. Shop drawings must show the actual window extrusions, and interfaces with the adjacent wall assembly for a specific project. This is contrary to the current practice of some window suppliers who are reluctant to get involved.

Full scale on-site mock-ups and sometimes testing of systems and details will help in understanding how a wall system is intended to function. The mock-ups need not be costly nor does it need to be done independent of the actual construction. The systems and details can often be built into the building and tested in place. If acceptable it becomes part of the finished building.

Some other suggestions:

- ◆KIS (keep it simple) Buildings with simple details or those that contain fewer of the details associated with problems work best and avoid troubles.
- ◆An envelope quality management protocol should be prepared and followed to assure quality is maintained. In some jurisdictions, for some building types, special consultants are now legislated.
- ◆Buildings with roof overhangs perform better, keeping more of the building protected.
- ◆Exterior clad wood columns are often poorly detailed, allowing water to accumulate.

Siding Principles

Siding systems can be put into one of three categories: face seal, concealed barrier, and rain screen.

Face Seal

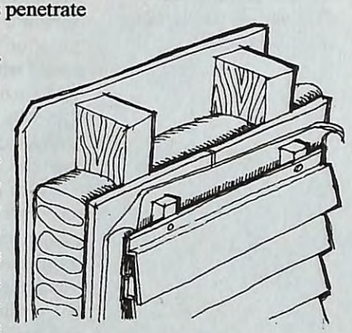
As the name implies, it relies for its protection on the perfect exterior seal. A face seal strategy attempts to eliminate entry paths for exterior moisture by sealing the exterior. In theory, a carefully applied stucco or EIFs finish will provide a good face sealed finish. However, weathering effects will in time break down the best seals.

Air tightness and drainage are provided at the face of the cladding. It is not intended that moisture is in contact with wood components placed behind the cladding. Drying is by capillary action and diffusion through cladding face.

Concealed Barrier

A concealed barrier system attempts to maintain a face seal. It also provides a weather barrier behind the cladding to resist the migration of moisture further into the wall assembly and to direct water to the exterior when it does penetrate past the cladding.

Concealed barrier drying is by capillary action, diffusion, and a little gravity.



Rain Screen

A rain screen assembly uses the cladding to keep most of the exterior moisture outside the assembly but makes significantly improved provisions for drying and drainage. The key difference between a rain screen assembly and a concealed barrier assembly is the presence of a cavity that provides for free drainage of a larger volume of water. ☼

Wood Panel Product Standards

Technological change means new products. When new products appear, considerable jockeying takes place among manufacturers for recognition and market share.

The recent flurry of announcements from manufacturers of plywood and other engineered wood panels falls into this category. In part, this is the fallout from the U.S.-Canada Free Trade Agreement adopted in the late 1980's a requirement of which is the development of harmonized performance standards for Canadian and U.S. products.

For wood structural panels, such as plywood and oriented strandboard (OSB), review and revisions of the standards (in Canada CAN/CSA 0325.0-92, Construction Sheathing and in the United States Voluntary Product Standard PS 2-92, Performance Standard for Wood-Based Structural-Use Panels) were the result of years of work by a Committee comprising representatives from Canadian and U.S. industry and government organizations, including CHBA, CMHC, National Research Council, Council of Forest Industries, Forintek, APA, NAHB, International Conference of Building Officials, National Institute for Standards and Technology, and independent experts from both countries.

The object is to assure that panels manufactured under either standard are suitable for the products' designated applications in both countries. CSA-0325 and PS 2-92 are in addition to prescriptive or manufacturing standards that continue to exist in both countries. In Canada, for example, the prescriptive standards for plywood are CSA-0121, CSA-0151 and CSA-0153, and for OSB it is CSA-0437.

A *manufacturing standard* defines minimum manufacturing requirements, such as wood species, veneer thickness, or knot sizes in plywood. A *performance standard*, on the other hand, defines the requirements that a product must meet to make it suited for the intended end use (e.g., bending strength and stiffness, concentrated load capacity, durability, etc.) no matter how the product is made.

Performance standards offer manufacturers freedom and flexibility to use innovative manufacturing technology, thus encouraging production efficiency, more efficient use of wood fibre resources and help contain the cost of the finished product.

Because CSA-0325 is a new standard, it is sometimes misunderstood. It governs wood structural panels designed for use as single-layer subflooring, subflooring used with panel-type underlay, roof sheathing, and wall sheathing. These can include plywood, oriented strandboard,

Continued on page 9

Certified Building Products

by Luc Saint-Martin, Secretary, Canadian Commission on Building and Fire Codes

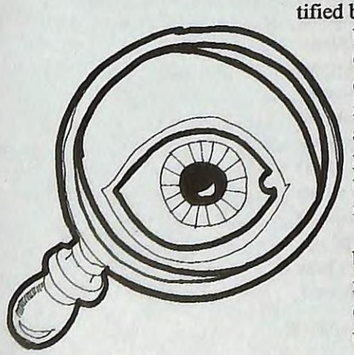
The National Building Code of Canada (NBC) references many standards that cover the manufacture and installation of building products. Some standards are concerned with life safety, such as those for structural design, while others are concerned with the physical and performance characteristics of products like plywood or clay bricks. Typically, standards specify desired qualities for a product so that it is suitable for an intended use and meet the user's expectations.

There are many ways by which conformity to standards can be established: these can include testing, manufacturer's declarations, evaluation and certification. Third-party certification is the most comprehensive method of conformity assessment.

Certification is the confirmation, by an independent organization, that a product or service meets a requirement. Certification entails physical examination, testing as specified in appropriate standards, plant examination and follow-up unannounced plant inspections if standards are met. This procedure leads to the issuing of a formal assurance or declaration, by means of a registered certification mark or certificate, that the product, process or system is in full conformity with specified requirements.

Generally, certification programs in Canada are designed to meet the needs of regulatory authorities and provide the greatest assurance that a product or service meets a requirement. The NBC and most standards referenced in the code do not require certification by a third party. Authorities having responsibility for applying building regulations sometimes require certification of certain products either directly or implicitly.

For example, the Alberta Uniform Building Standards Act requires that mobile homes be certified by the CSA or other organization approved by the provincial authorities. Similarly, the Ontario Electrical Safety Code requires that electrical equipment be "approved", meaning that it has to bear the registered mark of a certification organization approved by the provincial authority (such as CSA or UL). In these cases, certification is clearly a requirement for the product to be acceptable.



In other cases, certification is deemed to be required by the authority: this is the case for fire doors. Though certification for fire doors is not required either by provincial or territorial jurisdictions, or by the building code or applicable standards, building officials expect to find a label that will assure them that the product is "listed" by a certification organization. Because fire doors must meet a standard fire test to determine their suitability for a particular application, building officials otherwise would require complete test reports with each door delivery to the site. The label certifying conformity is thus a convenient way of ensuring that the door will have the required fire-protection rating.

Regulatory authorities have specifically requested that the applicable standards include requirements for quality auditing of some products. For example *CAN/CSA-0325.0-88 Construction Sheathing*, states that only products produced under a quality assurance program can be represented as conforming to the standard. All panels must be marked with the name or logo of the manufacturer, the date of manufacture, the designation "CSA 0325", the nominal thickness and the name of the certification organization, where applicable. The quality assurance program is a mandatory part of the standard and, though implementation by a third party is only a recommendation, it is the expectation of regulatory authorities.

Looking for the certification mark before accepting a product is important for building officials and builders. This mark is their best assurance that the product meets the applicable standard. It is also important to recognize that manufacturers that follow a certification program incur additional costs, for which they get no value if builders and inspectors fail to look for the certifications. The representatives from provincial and territorial ministries responsible for building regulations recently stated that to ensure the integrity of such products, building officials should only accept marks from certification organization accredited by the Standards Council of Canada. This will help to confirm the value of the certification process and protect public interests.

At this time, the following organizations are accredited by the Standards Council:

APA - The Engineered Wood Association (APA)
Bureau de normalisation du Quebec (BNQ)
Canadian Gas Association (CGA)
Canadian General Standards Board (CGSB)
Canadian Standards Association (CSA)
Canadian Welding Bureau (CWB)
Council of Forest Industries (COFI)
Inchcape Testing Services/ETL
Underwriters Laboratories Incorporated (UL)
Underwriters Laboratories of Canada (ULC)
Warnock Hersey Professional Services (WHPS)

The Environmental Crisis

Wonder why we're in the social and environmental mess we're in today?

As our technological prowess emerged in the 19th and 20th centuries, three major forces altered our thinking:

- A sense of control and power that allowed us to do anything we wanted. Electric power, air conditioning, elevators all gave us a sense that we could build anything, anywhere, anyhow because we could control what was inside.
- Telecommunications, which eliminated the need for proximity to afford effective communication.
- Our automobile passion, which has shifted our focus from planning for people to planning for cars and which has destroyed public transportation systems, isolated communities and depersonalised our lives.

Add to these factors a feeling that all resources were unlimited and you have the recipe for our current crisis; a crisis where people and the environment have become enemies.

A picture is worth a thousand words

The natural gas industry touts itself as the "clean choice" fuel, in large part because the principal flue gasses from natural gas combustion are water and carbon dioxide. Those who've cooked on a gas stove without opening the vent or a kitchen window will recall how quickly the humidity inside rises.

When you burn gas in a furnace or water heater, the same thing is happening. The higher the efficiency of the appliance, the more complete the combustion, and the fewer flue gasses. Mid-efficiency appliances (+80% efficient) are becoming more common. These usually have a vent fan to discharge flue gases. One handy feature is that with the more efficient appliance, you don't have to vent through a chimney, but through a smaller diameter pipe through the wall.

What has to be recognized is that all that water vapour, when it encounters a cold surface, will condense and freeze. Even chimney flues can ice up in some conditions. On the sidewall, it can lead to rather unsightly ice conditions.

The photo shows a condition in North Vancouver during a recent cold spell. ☼

Continued from page 7 (Wood Panel Standards)

waferboard and composite panels (panels with reconstituted wood cores and veneer faces).

As these products can be exposed to the weather, including delays during construction, they are manufactured with exterior type adhesives. CSA-0325 requires that the adhesive "*shall be phenolformaldyde resin, or any adhesive or bonding process that provides equivalent or better resistance to moisture, heat, attack of fungi and microorganisms, chemicals, and creep.*" The committee drafting the standard intended it to be fully compliant with the National Building Code of Canada. Product meeting CSA-0325 is recognized in the NBC (Section 9.23) and the standard itself in Part 2.

The uses covered by CSA-0325 are protected from permanent weather or moisture exposure by finish siding and roofing materials, so the products don't have to be suitable for permanent exterior exposure but an exterior bond is prescribed.

In terms of quality and performance, does it matter if the product is manufactured according to a prescriptive or performance standard? Not really, because both types of standards are intended to assure the products are appropriate for the applications in which they are used. Of far greater importance is the effectiveness of the quality assurance program of the particular mill.

One measure of quality is whether a given mill's quality certification agency is accredited by the Standards Council of Canada (SCC). Plywood and OSB are not required to be certified by an SCC accredited organization, but senior building code officials have suggested that officials should look for products certified by organizations accredited by SCC. These include APA-The Engineered Wood Association (formerly American Plywood Association) and the Canadian Plywood Association. ☼

Technical Research Committee News

Canadian Home Builders' Association

Don Johnston named Senior Director, Technology and Policy

Don Johnston, formerly the Director of CMHC's Housing Innovation Division, no stranger to the housing industry, has been named as the new Director of Technology and Policy for CHBA. Don is taking over from Bob Sloat who has returned to the world of home building in Calgary. We welcome Don to CHBA, and look forward to working with him in his new role.

Special thanks go to Bob Sloat for his hard work and dedication over the past eight years on behalf of the TRC.

Carpet Related Health Problems Information Needed

Several reports have been received about carpet installers becoming ill on the job (symptoms may include nausea and vomiting). Apparently this happens after exposure to the materials during the installation of carpets. Investigations are going on to find out if these are isolated incidents, caused in part by adhesives being used, or if there is something more significant. We would like to hear from anyone who has experienced problems, or know of some who has. The more information that can be provided, the easier it will be to track down the nature of the problem, and even how wide spread it is. If you know of any such happenings, let Ross Monsour at the TRC know.

Home Inspection Industry

The growth in recent years of home inspection services is raising questions about professional competency. Municipal building inspectors work with clearly defined statutory terms of reference and the building code, and generally must have some technical background (it may be engineering, architecture, trades training, or even recognized field experience).

However, there are few restrictions on anyone setting themselves up as a "home inspector." These are the people that most often do prepurchase inspections for homeowners. Yet they may also be called on to pass judgement on houses or problems for any number of other reasons. There are several organizations, some North America wide, others regional, that are trying to set minimum standards, introduce training and establish certification programs. Some rely on a solid technical background, others are less technically inclined and have low accreditation standards.

CMHC has launched a survey of the home inspection industry. The hope is that the many people involved will find a way to come together in a more professional manner and raise the minimum industry standards, perhaps by organizing under a single industry umbrella.

The issue of home inspection services will become more critical as current trends suggest more "privatization" of services once in the public sector. This could mean that basic health and safety code inspections, once the job of municipal inspectors, may be done by others. Home inspectors may be able to do some building code compliance inspections. To maintain credible standards, there should be some form of professional policing body to oversee standards.

CMHC Publications

CMHC produces many excellent publications: everything from simple pamphlets, to reports on fundamental research, to in-depth books and videos. Some are targeted to consumers, others are for professionals. However, while the materials have been produced, they have not always been getting out, as CMHC did not have an effective outreach marketing capacity. To overcome this problem, distribution of publications, in particular those targeted for wider audiences, is now being handled by a book publisher: Fitzhenry & Whiteside.

This means that many publications such as the Building Materials for the Chemically Hypersensitive, or the Clean Air Guide should be found at your local bookstore.

Advanced Houses

The final reports for the various Advanced Houses are either completed or in their final stages. These include information from the monitoring programs, what worked, what didn't, what needs to be studied. Information on the specific Advanced houses is available from Tim Mayo, the Advanced Houses Program Manager. He is also available to provide a workshop on the program.

Construction Technology Updates

Construction Technology Updates is a new series of technical publications on construction science and technology, launched by the National Research Council's Institute for Research in Construction. It is designed to provide practical, easy to read technical information to practitioners to improve building performance and solve problems. The updates will deal with buildings and structures, covering topics such as leaking roofs, moisture in walls, design of air barriers, heat loss, rehabilitation of old buildings, deteriorating concrete, indoor air quality, fire protection and noise control. Each issue (up to 6 pages long) will deal with a single topic and contain enough fundamental information to enable practitioners to understand the science underlying a particular problem and its solution

Construction Technology Updates are similar to the Canadian Building Digests that were so popular a number of years ago.

Construction Technology Updates are available by subscription ($49.00 per year). For information call toll-free 1-800-672-7990. (In Ottawa-Hull and outside Canada, call 613-993-2643). Or at Http://www.nrc.ca/irc/ctubrochure/ctubrochure.html/.

National Energy Code

Details of the National Energy Codes have been completed and the two Codes (one for houses, one for buildings) were given final approval by the Standing Committee on Energy Conservation in Buildings in a letter ballot in September. Final production operations are underway and the final document should be completed by spring 1997. Right now it is not certain that any jurisdiction will be implementing the energy code, although it should serve as a model for minimum energy performance standards. However, the energy code will be used by some public sector agencies (federal and provincial) as the benchmark for any new construction they purchase.

CHBA Position Paper on Contaminated Lands

The contaminated sites issue is restricting redevelopment of many areas in Canada's cities. Procedures designed to deal with highly toxic sites now are being applied regularly to all other lands. Cleanups are triggered when owners apply for financing, or for redevelopment approval.

Many once industrial lands, if cleaned up economically, are prime targets for redevelopment, bringing new vitality to declining or abandoned areas. However, there are many obstacles to redevelopment. To solve them, government and the private sector must resolve three critical issues: limits to liability, reasonable standards, and government involvement.

The CHBA position paper, presently in draft form, has been circulated to all locals, and will be reviewed by the TRC and Executive Board at their Calgary annual meetings.

Limits to Liability

With current legislation, anyone whoever owned or had control of lands with contaminants can be found liable for part or all of the cleanup costs. The market risks of development are relatively well known and can be factored in, but there are enormous additional risks in remediation. Those are the risks of future liability. Right now, if standards change sometime in the future, builders and developers can be held liable for another cleanup. Provincial governments should enact specific exemptions to protect builders and developers from future liability in such cases.

A current owner who is a builder or developer who actively worked to remediate the site to then-current requirements, should be exempted from all liability for future cleanups unless the initial cleanup was negligent.

Reasonable Standards

Standards and procedures initially devised to clean up environmental mega-problem sites are far too onerous to be practical for the redevelopment of small land tracts such as urban brownfield sites.

Setting criteria for various contaminants is far from an exact science. Levels that pose a risk to human health vary widely. Generic cleanup criteria are often far more onerous than required for protection of human health.

An open, public system must be developed to review cleanup criteria and evolving risk assessment/risk management procedures on a national basis -- with much more input from the planning, development and building sectors. One appropriate model might be the system used to amend the National Building and Fire Codes.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector.

Canadian Home Builders' Association, Suite 200, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214
e-mail: chba@chba.ca
http://www.chba.ca

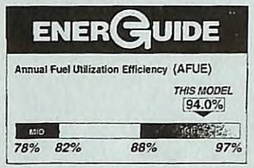
With support from the provinces, this approach can avoid "surprise" requirements, identify potential problems, remove impractical aspects of requirements or discover better alternatives for reaching the same goals.

Government Involvement

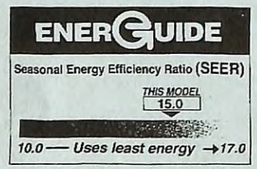
Governments have an important role to play in supporting brownfield cleanup and redevelopment through appropriate allocation of public resources. Brownfield sites deliver little revenue. If they are remediated during redevelopment, they will start to generate income and property taxes, make better use of existing infrastructure, bring a new vibrancy to decaying older areas of cities, and improve the environment.

The costs and benefits of such public sector investment should be calculated, including the public benefit of vibrant developments in areas currently abandoned or in serious decline. The current situation is gravely affecting the ability of the housing industry to supply needed housing, particularly on urban sites. ☼

Heating Equipment Labelling



Gas & propane furnace label



Central Air-conditioners and heat pump label

For more information about the new HVAC Energy-Efficiency Rating Program call HRAI at (905) 602-4700. Utilities can call NRCan at (613) 947-1948.

Comparison shopping for home heating and cooling systems should become easier with the New Energy-Efficiency Ratings. The EnerGuide energy-efficiency rating system has been extended to residential gas furnaces, central air conditioners and air-to-air heat pumps. It will provide a simple way for consumers to compare the energy efficiency of different models of home heating and air-conditioning products.

Natural gas and propane furnaces, air conditioners, and heat pump product literature will now incorporate an easy-to-read label showing a model's Annual Fuel Utilization Efficiency (AFUE) rating for natural gas and propane furnaces, or a Seasonal Energy Efficiency Ratio (SEER), for air conditioners and heat pumps. This visual tool will help contractors and other suppliers of residential heating, ventilation, and air conditioning (HVAC) systems to explain product energy-efficiency ratings to consumers.

The EnerGuide rating is shown on a horizontal bar scale, allowing the consumer to evaluate the efficiency of the model against the efficiency of a range of products permitted for sale in Canada (according to provincial and federal regulations). Consumers will be able to make an informed purchase that is both economically and environmentally responsible, and help sell more energy efficient products. Unfortunately, the label is placed on the product literature, not on the product itself. By January 1, 1997, all manufacturers' literature should include the rating.

Products covered

- Unitary split-system central air conditioners and air-to-air heat pumps having a capacity of less than 65,000 Btu/h (19.05 kW).
- Gas-fired, forced-air furnaces (other than for mobile homes and recreational vehicles) using propane or natural gas and having an input of less than 225,000 Btu/h (65.94 kW).
- As the HVAC Energy-Efficiency Rating Program expands, other equipment will be included.

HRAI and participating HVAC manufacturers are responsible for administering the program. With NRCan, promotional and educational programs for dealers, contractors, energy utilities and consumers have been developed.

Residential Air Conditioning Sales Increase

Is it a sign of global warming? Canada now becomes a cooling climate? Sales of residential air-conditioning (cooling) units for 1996 are projected to increase 14% to 132,689. The forecast for 1997 is 133,491 units.

It's amazing that for so long we survived without, and now we need cooling in a country where winter is the dominant season. Granted, a few parts of the country do experience a period of hot and muggy weather, but it's generally fairly short term. What does air conditioning do for the affordability equation?

Home Energy Ratings

A quarter of all energy used in Canada is for operating homes - space heating, lighting, appliances, and cooling. Programs to reduce energy use have focused on new homes through improved construction practices: minimum insulation levels in building codes, and energy efficient home programs such as the R-2000 New Home Program.

However, the number of new houses built each year is small: less than 1% of the total housing stock in the country. Concerns have been expressed that, as the bulk of housing stock for the next century has already been built, it is not affected by the new energy codes or standards. This older housing stock is also a competitor for builders trying to sell newly built R-2000 or even conventional houses.

The challenge for dealing with older housing stock (and even current, conventional construction) has been the lack of effective tools by which houses can be tested and identified. Many ideas have been bounced about, but little of substance has happened. Retrofit programs have been run at various times by utilities or other agencies, but they've tended to have a narrow scope. In the USA where there are many labelling programs, most have also have a limited scope.

NRCan and its industry partners have been working for several years on a broad-based rating program suitable for the variety of climates and housing stock found in Canada. The Canadian Home Energy Efficiency Rating System (CHEERS) will offer a reliable tool to assess the energy performance of a house. CHEERS is building on the history of building science and energy analysis gained over the past 20 years.

The prime objective is to improve the energy efficiency of our housing stock. As a result, the evaluation methods are designed to be fuel neutral (although solar energy is given favourable status.) The evaluation system is also technology neutral - unbiased toward upgrading any specific element, while respecting health, safety, durability and comfort needs. It recognizes that the house is a system, and an indoor air quality checklist will be part of the evaluation. This means that the entire house and its permanent systems are rated. Size, shape, orientation and airtightness are all considered. Temporary or uncommon features and lifestyle or leisure items (even if energy consumers) are not considered.

A CHEERS rating will require a computerized analysis of a house. It is designed to be capable of being done quickly at low cost, even though a simple airtightness test is part of the program. A simplified version of the HOT-2000 software is nearly complete for this analysis. For existing houses, the software will be able to compare current energy bills against predictions, to match assumed values for construction elements for which assumptions have to be made. For existing houses, it will suggest specific energy efficiency improvements that should be considered.

The rating produced will show a comparison of purchased energy needed to operate the house against benchmarks such as R-2000 targets. The design of the label is still under development. The CHEERS rating is significantly different from the proposed label for the Ontario Building Code. The proposed OBC label only calls up insulation levels. In the CHEERS, all elements, including airtightness and mechanical systems, are considered.

The intent is that with industry participation, old and new houses will be rated. The rating offers homeowners and lending institutions a realistic indication of house performance and confirmation that energy conservation claims made for new or retrofit construction are realistic. It could also be used as a marketing tool, to provide credibility for energy efficiency upgrades.

The infrastructure for CHEERS has not yet been established but the R-2000 Program delivery model is being considered. This means that industry will be a major player. ☼

Electronic Thermostat Credit

Electric Baseboard Heated R-2000 Houses

Conventional bimetallic thermostats have poor control and cause the indoor temperatures to be higher on average than the set point. Although they may be set at 21°C, the average temperature may be closer to 23°C. Higher temperatures mean higher heat losses. This has been an issue with electric baseboard heating systems. New electronic controls now available are much more accurate.

To encourage wider use of the better thermostats, a credit of 1% is now available only for electric baseboard heated R-2000 houses that use electronic thermostats. To calculate the credit, once the R-2000 energy targets have been calculated by HOT-2000, take 1% of the "annual space heating energy consumption" and add it to the R-2000 target.

Thermostats used with furnace systems are generally more accurate, are not subject to high control errors, and are not eligible for the credit.

R-2000

For information on the R-2000 Program, contact your local program office, or call 1-800-387-2000

Carbon Monoxide and Combustion Appliances

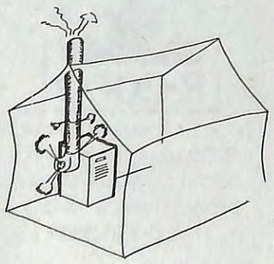
by Richard Kadulski

One certainty about combustion appliances, despite the fuel source, is that the combustion process generates gasses. When the appliance is tuned and operated properly, there should be few toxic gasses generated and all will be vented safely. Unfortunately, ideal conditions are not normal conditions, and there are many exceptions. The potential for trouble is always there. Even new, correctly installed equipment can have problems, sometimes catastrophic.

Carbon monoxide (CO), fatal at higher concentrations, is the most dangerous combustion product. It is generated when combustion is incomplete, as may happen when combustion air access is blocked, there is dirt on the burners, and gas pressure is not correct.

Every winter we hear about the poor souls who died when their heating equipment malfunctioned in cold weather and spewed combustion gasses into the house. Often, it involves low income people who must rely on cheap heating appliances that at best are poorly vented. When it happens in a newer, middle class suburban home, the situation attracts more media attention. A couple of years ago there were several incidents of carbon monoxide poisoning in Saskatchewan. The cause was flues blocked by ice during a prolonged cold spell, so that all combustion gasses spilled into the house.

Conditions don't have to be so dramatic for incidents to happen. Over the holidays we had a near tragedy: a 4 year old high efficiency condensing, sealed combustion gas furnace in my brother's house in North Vancouver was discovered to have been spewing CO into the house. The gas company measured an average concentration of 164 ppm. It is not certain how long the gasses were spilling into the 4 year old energy efficient house. The problem was a major furnace malfunction. The heat exchanger was found corroded, and seals on the access cover to the combustion chamber were burned, so it is possible the spillage was through the gasket, which also may have created improper conditions for proper combustion. The cause of the problem is being investigated.



One safety feature was the fact that a heat recovery ventilator had been installed, and was operating continuously, so that it diluted the gases in the house.

Thomas Greiner at Iowa State University Extension mentions that he's seen many heating systems with high CO levels. Frequently the causes may be installation errors, especially in combination with unsealed domestic hot water heaters. A common problem is unsealed ducts and inadequate return air creating high negative pressures in the basement, leading to flue gas spillage from the hot water heater.

Equipment itself does not seem to be a major problem, although many early high efficiency units installed in the 1980's may have been poorly designed and the metal in the heat exchangers was not able to stand up to the condensing gasses. These are failing now.

CO Poisoning Symptoms

The symptoms of CO poisoning include headaches, decreased alertness, dizziness, nausea, flu - like symptoms, and weakness. Many of these were already suffered by the couple in the North Vancouver house, so the cause was not initially traced to appliances in the house because there were other serious health problems present. In effect, the CO made an already compromised health situation worse. It was only after the fact that some symptoms could be explained.

Since the incident was discovered, in talking to installers and suppliers I've discovered that high levels of CO are encountered more often than people care to admit or are aware of. It is entirely coincidental that Lennox has launched a CO awareness campaign in the USA.

What Causes Premature Furnace Failure?

◆**Incorrect temperature rise across the furnace heat exchanger** (too high or too low). This could be caused by incorrect blower speed, poorly sized ductwork, blockages in the ductwork, dirty filters, or even lack of filters.

◆**Taking air from inside the house**. Contaminants inside the house are hard on high efficiency units because of condensation and acid formation. Sealed combustion units are better.

◆**Incorrect gas flow rates**. Overfired units run rich and hot. They don't have enough air for complete combustion, leading to cracking of the heat exchanger, sooting, and carbon monoxide generation. This can be solved by the adjustment of gas pressure - a simple matter for gas installers.

◆**Furnace oversizing** This causes rapid on/off cycling without enough time to heat the furnace exchanger or the vent. Condensation is formed and it does not get evaporated out.

CO Detectors

This incident has firmed my resolve to specify that CO alarms be installed in all houses I design that will use any form of combustion heating appliances. Not all sensors are that accurate, but even a sensor that is 20% or 30% off true will provide a warning when CO levels of concern are reached. The sensor should be hard wired just like smoke alarms. The relatively low cost of a detector is a one time expense that provides an inexpensive life insurance policy. All builders should be encouraged to follow suit. (Consumers Report, Nov. 1996 reports on CO detector tests).

Preventive Maintenance

Perhaps most important, it is necessary to impress on home owners that regular maintenance is necessary. We have become so accustomed to the seemingly trouble-free equipment available today (especially gas fired equipment) that we forget that regular maintenance is needed. In the era when oil was the dominant heating fuel it was not as big an issue. Then suppliers provided an annual service check of the equipment as part of their sales contract. The suppliers understood that oil fired equipment required regular tuning, so they made it part of their sales package. ☼

Lennox Launches CO Awareness Campaign

A major consumer initiative has been launched by Lennox Industries in the USA. The program is focusing on awareness and prevention of carbon monoxide (CO) poisoning in the home. The danger of CO poisoning exists in any type of home.

Home heating systems are far from the primary cause of CO creation in the home. All fuel-burning appliances together cause less than 5% of the 5,000 accidental CO poisoning deaths in the USA each year, but one death should be considered too many for the HVAC industry. Lennox is undertaking this campaign from a belief that it's the right thing to do.

Lennox is encouraging dealers to promote CO safety - whether it's a car, oven, furnace, or any other potential CO source. This is being done by an information program to inform the public about CO prevention and detection. Prevention is the most important step in dealing with CO.

Carbon monoxide detectors are effective when used in combination with preventive maintenance. Regular maintenance checks by a qualified service technician should be considered as important and routine as annual maintenance on your car. Unfortunately, many consumers are unaware that annual maintenance of fuel-burning appliances is important. This is something builders must impress on their customers.

Common sense precautions recommended include removing your car out of the attached garage to let it warm up, wheeling lawn mowers out of the garage to start them, and never using gas ovens or grills to heat your home.

What is Carbon Monoxide?

Carbon monoxide (CO) is a colourless, odourless, tasteless gas produced by the incomplete combustion of fuels such as wood, natural gas, gasoline, diesel, kerosene, coal and charcoal. It is caused by lack of oxygen or a disruption in the burning process. Household appliances such as furnaces, water heaters, stoves, space heaters, charcoal grills and gas dryers can be sources of carbon monoxide, especially if they are not in proper working condition or have been installed improperly.

What Are the Effects of CO?

Carbon monoxide combines with the red blood cells much more easily than oxygen does and creates a condition known as carboxyhemoglobin saturation. Instead of oxygen, CO then gets carried to the vital organs through the bloodstream. Organ tissues require oxygen, and without it the body starts to suffocate. It takes the body much longer to eliminate CO than to absorb it, which is one reason that exposure is so dangerous.

The symptoms caused by carboxyhemoglobin saturation are easily overlooked because they are often flu-like. With mild exposure, most people experience headaches, fatigue and nausea. Medium exposure can cause a throbbing headache, drowsiness, disorientation, confusion and accelerated heart rate. Extreme exposure can lead to unconsciousness, convulsions, cardiorespiratory failure, coma and death. ☼

Ontario Building Code Changes: A Dissenting Voice

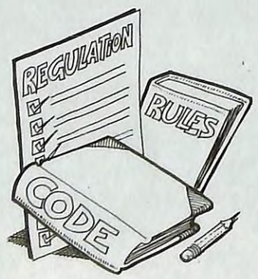
While this story relates to Ontario concerns, insights can be gained regardless where you live. It's an interesting case study of what happens when ideology and politics clash with technical facts - and the facts get ignored. No one wants unnecessary regulation, but we need benchmarks that everyone must meet. However, regulations must be justified both on cost and technical benefits in the interests of the whole community. In Ontario, it seems that policy and regulations are being influenced by a small number of large urban tract builders with a narrow, short term focus.

Automakers wailed about pollution controls, seat belts, other safety features, and energy efficiency. Without regulations these features likely would not have been introduced. The results are lower pollution levels in urban areas, fewer injuries and fatalities for the common good of the community. The features are no longer disputed.

Regulations governing home building must be viewed in a similar way.

It's not always true that small communities are conservative in their outlooks. Interesting and progressive ideas can also be found in smaller communities. The Lanark-Leeds Home Builders' Association, one of the smaller local builders' associations in Ontario has prepared a well-researched review and challenge to the proposed Ontario Building Code (OBC) changes.

The local HBS is strongly opposed to the position taken by the Ontario Home Builders Association (OHBA) to support changes reducing minimum insulation and ventilation requirements. The opposition and concern have led the builders of this small eastern Ontario organization to do their homework and show why going back on the minimum insulation levels is not the right thing to do. As they state in their submission to the Ontario Minister of Municipal Affairs, they feel *"compelled by our commitment to professionalism, and to the consumers of Ontario, to break rank with OHBA on the two proposed changes, which if approved, will throw an important aspect of homebuilding in Ontario back to 1975 standards. We firmly believe that we cannot put our heads in the sand, ... turn the clock back a quarter century and deny what we have learned about homebuilding."*



They remind the Minister that OHBA, although it may be the recognized industry association, in fact formally represents only 14% of registered Ontario builders (all builders in the province, by law, must be registered with the Warranty program). However, OHBA builder members represent 56% of new housing units built in the province.

Applying the same principles established by the Ministry to guide code development, they point out significant flaws in the code change proposals.

Principle 1: that primary focus be on standards to protect consumer health, safety and accessibility.

They point out that a reduction in insulation levels (up to 33%) and elimination of HRV requirements for some houses will affect the health of residents within the house due to greater condensation on cold surfaces, and greater mould and mildew growth inside the house. It will also affect the general health of the general population as increased energy consumption due to less insulated houses will lead to higher CO2 emissions from housing, higher levels of smog and related respiratory ailments.

Even a 1996 OHBA position paper (Construction Standards for Basements) stated "there are legitimate health and safety interests and public policy interests in energy conservation to be addressed by regulation minimum insulation."

Principle 2: that code provisions be justified based on cost effectiveness for the consumer.

Using the Ministry's own figures, they point out that existing (1994) insulation and ventilation provisions were based on a rigorous cost analysis. Lower insulation levels will increase energy costs per house (over 25 years) by more than $15,800 for electric, $3,100 for gas, and $5,000 for oil heating.

Principle 3: that construction costs will be a critical factor for assessing amendments.

The incremental cost being used to justify reducing the energy conservation measures was a figure of $8,000 provided by OHBA. That number was proven to be grossly exaggerated. At a Ministry-sponsored forum to review the issue, the incremental figures ranged from $600 to $3,500 for the worst case scenario. In fact, the Lanark-Leeds Home Builders' Association suggests that the incremental costs are offset by reduced heating loads and lower capital costs of heating equipment In those areas where the heating equipment is rented from utilities, the use of combination heating systems may effectively mean no net increase in construction costs.

The Ontario New Home Warranty Program has identified that elimination of basement insulation and drainage requirements will increase claims and payouts. They made a conscious choice not to resist these changes "so as to assist builders with the affordability question." As the Warranty program is a mandatory insurance, increased claims can only mean higher premiums, added to the purchase price.

Other Issues Raised

Although the stated goal is to increase construction jobs, they point out that in fact the proposed changes may be counter productive. New homes built to the proposed code will lead to job losses in home building and building products industry, be more polluting, increase CO_2 emissions, and accelerate the depletion of finite fossil fuels. In eastern Ontario, they forecast an increased influx of manufactured electric baseboard heated housing from Quebec, which can't easily comply with the current OBC requirements.

Consumer Choice

Proponents of lower standards proclaim that consumers should be the ones to decide acceptable construction features. Last year, the full height basement insulation and drainage layer requirements were removed (to "let the consumer choose"). According to the Ministry's calculations those changes should have resulted in a savings to consumers of $1,000 per house. In fact the savings did not appear. According to a survey of Toronto area builders, 42% indicated no change in price, while 33% reported a price increase (more for less?).

More disturbing, consumer choice did not happen either. Only 25% offered basement insulation as an option, 33% offered no option, and 17% kept basement insulation as a standard. As for foundation drainage, 50% did not offer the option, while only 25% gave the option. (Some sites had begun before the code changes became effective).

What is not stated is that for consumers to ask for these features, they have to be knowledgeable in technical matters. We know that in reality that is not so. ☼

HRAI Changes

At its last annual meeting the Heating, Refrigeration and Air-Conditioning Institute of Canada decided to restructure its organization. In part, this change reflects changes in the nature of the industry and its greater sophistication. When it was originally started, HRAI was primarily a mechanical product manufacturer's organization. Today more contractors and wholesalers are members. Each sector has special needs and interests that make a single organization unwieldy.

Under the new structure each Division will have its own Board of Directors reporting to a much smaller general HRAI board.

Manufacturers have dropped "Suppliers" from their name and call themselves the HRAI Manufacturers Division.

Contractors have opted for a new name: Heating, Refrigerating and Air Conditioning Contractors Association of Canada (HRAC).

The Wholesalers also have a new name: Canadian Heating, Refrigeration and Air Conditioning Wholesalers (CHRAW).

Information:
HRAI
Tel: 905-602-4700
or 1-800-267-2231
Fax: 905-602-1197

Energy Conservation Products Trade Show

Energiesparmesse + Baumat 97
Tel. 43-732-6584-4380
Fax.43-732-6584-4383
e-mail esv1@esv.or.at
Http://www.esv.or.at/esv/

How big is energy conservation in other parts of the world? We received notice recently about one of Europe's largest building and heating trade shows. Austria's Energiesparmesse + Baumat Wels is a home show with substance. It displays everything that's needed for building or renovating houses, with products that will save energy.

The displays at the three day show, in a 60,000 m^2 exhibition ground, are arranged by type of product so that you can find exactly what you are looking for, and compare products and prices to your heart's content.

Product groups include:

Automatic controls - Bath/shower - Building materials - Chimneys - Chippers and chopping machines - Draining and drying walls - Gas heating - Heat distribution systems - Heat pumps - Household - Oil heating - Prefab houses - Roofing - Solar technology - Solid fuel heating - Sunshades - Thermal insulation - Tile stoves - Water treatment - Winter gardens - Windows/doors/stairs - Wood chip heating

An interesting feature of the fair is the free consulting services to answer questions about improving energy efficiency, designing a new bathroom or fitting your living room with new tile stove and also lectures by recognised experts. A 3,000 m^2 hall is set up for consultants to work from.

The fair is not in any major centre, but in Wels, Austria, which is 200 km from Vienna, and 100 km from Salzburg, and from Munich, Germany, so the catchment area for the fair includes southern Germany, Austria, Czech Republic and Slovakia.

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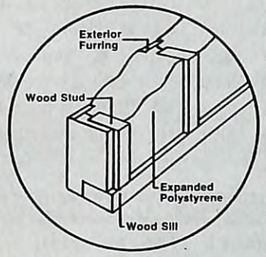

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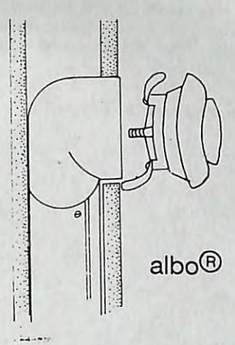

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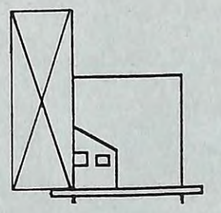

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